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ACCESSION NBR:9109160127 DOC.DATE: 91/09/04 NOTARIZED: NO DOCKET #
 FACIL:50-244 Robert Emmet Ginna Nuclear Plant, Unit 1, Rochester G 05000244
 AUTH.NAME AUTHOR AFFILIATION
 BACKUS,W.H. Rochester Gas & Electric Corp.
 MECREDY,R.C. Rochester Gas & Electric Corp.
 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 91-008-00:on 910805,Maint Dept observed that solid state switch printed circuit card for safeguards bus 14 undervoltage monitoring/protection sys damaged.Caused by temp related failure of solid state switch.W/910904 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 10
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:License Exp date in accordance with 10CFR2,2.109(9/19/72). 05000244

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ROBERT C. MECREDY
Vice President
Ginna Nuclear Production

TELEPHONE
AREA CODE 716 546-2700

September 4, 1991

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: LER 91-008, During Maintenance, A Failure Of One Of
Two Trains Of Undervoltage Protection, Was Discovered
On Safeguards 480 Volt Bus 14
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

This event is being voluntarily reported using the guidance of NUREG-1022 (Licensee Event Report System), and Supplement No. 1 to NUREG-1022. This report is intended to alert other utilities which may have similar systems. This event is related to, but does not meet, the reporting requirements of 10CFR50.73, items (a)(2)(v)(D) and (a)(2)(vi). Item (a)(2)(v)(D) requires reporting of "any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident". Item (a)(2)(vi) states that, "Events covered in paragraph (a)(2)(v) of this section may include one or more personnel errors, equipment failures, and/or discovery of design, analysis, fabrication, construction, and/or procedural inadequacies. However, individual component failures need not be reported pursuant to this paragraph if redundant equipment in the same system was operable and available to perform the required safety function." The attached License Event Report LER 91-008 is hereby voluntarily submitted.

This event has in no way affected the public's health and safety.

Very truly yours,
Robert C. Mecredy
Robert C. Mecredy

xc: U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Ginna USNRC Senior Resident Inspector

9109160127 910904
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LICENSEE EVENT REPORT (LER)

APPROVED OMS NO. 3180-0104
EXPIRES - 8/31/85

FACILITY NAME (1)

R.E. Ginna Nuclear Power Plant

DOCKET NUMBER (2)

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PAGE (2)

TITLE (4)

During Maintenance, A Failure Of One Of Two Trains Of Undervoltage Protection Was Discovered On Safeguards Bus 14

EVENT DATE (5)

LER NUMBER (6)

REPORT DATE (7)

OTHER FACILITIES INVOLVED (8)

MONTH

DAY

YEAR

YEAR

SEQUENTIAL NUMBER

REVISION NUMBER

MONTH

DAY

YEAR

FACILITY NAMES

DOCKET NUMBER (8)

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OPERATING MODE (9)

N

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

POWER LEVEL (10)

0 3 0

20.402(b)

20.406(a)(1)(i)

20.406(a)(1)(ii)

20.406(a)(1)(iii)

20.406(a)(1)(iv)

20.406(a)(1)(v)

20.406(a)

60.36(a)(1)

60.36(a)(2)

60.73(a)(2)(i)

60.73(a)(2)(ii)

60.73(a)(2)(iii)

60.73(a)(2)(iv)

60.73(a)(2)(v)

60.73(a)(2)(vi)

60.73(a)(2)(vii)(A)

60.73(a)(2)(vii)(B)

60.73(a)(2)(viii)

72.71(b)

72.71(a)

X OTHER (Specify in Abstract below and in Test, NRC Form 365A)

Voluntary Report

LICENSEE CONTACT FOR THIS LER (12)

NAME

Wesley H. Backus

Technical Assistant to the Operations Manager

TELEPHONE NUMBER

AREA CODE

3 1 5 5 1 2 4 1 4 4 4 6

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC
X	J, E	E, C, B, D	E, 1, 4, 6	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

EXPECTED SUBMISSION DATE (15)

MONTH

DAY

YEAR

YES (If yes, complete EXPECTED SUBMISSION DATE)

X

NO

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On August 5, 1991 at approximately 1800 EDST, with the reactor at approximately 30% full power, the Maintenance Department observed that a solid state switch printed circuit card for Safeguards Bus 14 Undervoltage Monitoring/Protection System was damaged. Following inspection of the damaged card, it was determined that the damaged card would have prohibited certain protective functions.

No immediate operator action was necessary as the "A" Emergency Diesel Generator was running tied to Bus 14 during the maintenance activity to satisfy plant technical specifications.

The cause of the event was determined to be a temperature related failure of a solid state switch printed circuit card.

Corrective action taken was to replace the solid state switch printed circuit card with a qualified spare, followed by a satisfactory test and return to service. Corrective actions to prevent recurrence are discussed in section (V)(B) of this report.



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO 3150-0104
EXPIRES: 8/31/85

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TEXT (If more space is required, use additional NRC Form 308A's) (17)

I. PRE-EVENT PLANT CONDITIONS

The plant was at approximately 30% reactor power and holding for secondary chemistry parameters to come within specifications, following a recent shutdown for turbine plant maintenance. The Maintenance Department was performing Maintenance Procedure, M-48.14 (Isolation Of Bus 14 Undervoltage System For Maintenance, Trouble Shooting, Rework, and Testing) as part of planned maintenance and troubleshooting for a number of recent problems with the safeguards 480 volt Bus Undervoltage Monitoring/Protection System (UVPS). These recent problems with the safeguards 480 volt Bus UVPS were generally limited to the failure of either of two solid state switch printed circuit cards, either solid state switch #1 (SSS#1) or solid state switch #2 (SSS#2). These two switches have been determined to be functionally equivalent and interchangeable. The following is a listing of the recent problems experienced on the Safeguards 480 Volt Bus UVPS:

- o June 29, 1991: LER 91-006 (Apparent Voltage Drop On Safeguards 480 Volt Bus 14 Causes An Automatic Start Of The "A" Emergency Diesel Generator). The underlying cause of the apparent undervoltage signal from the Bus 14 UVPS was not positively determined at the time the LER was submitted.
- o July 31, 1991: LER 91-007 (Safeguards Buses Undervoltage Relay Actuations Due To Failed Solid State Switches Causes Automatic Starts Of The "B" Emergency Diesel Generator). This failure was on the Bus 17 UVPS SSS#1 and was due to high temperatures at the circuit board, reducing the useful life of the electronic components.



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TEXT (If more space is required, use additional NRC Form 308A's) (17)

- o August 2, 1991: Also LER 91-007. This failure was on the Bus 16 UVPS SSS#2 and was due to high temperatures at the circuit board, reducing the useful life of the electronic components.

II. DESCRIPTION OF EVENT**A. DATES AND APPROXIMATE TIMES OF MAJOR OCCURRENCES:**

- o August 5, 1991, 1800 EDST: Event Date and Approximate Time.
- o August 5, 1991; 1800 EDST: Discovery Date and Approximate Time.
- o August 5, 1991, 2013 EDST: Bus 14 UVPS returned to service, after repairs and testing were satisfactorily completed.

B. EVENT:

On August 5, 1991 at approximately 1800 EDST, with the reactor at approximately 30% full power, the Maintenance Department, while performing a preventive maintenance effort (because of previous failures of the UVPS on Buses 16 and 17) observed that the SSS#1 card for the Bus 14 UVPS was damaged, (i.e. the card showed burnt indications). Following inspection of the damage done to the SSS#1 card, it was determined that the damaged SSS#1 card would have prohibited actuation of the auxiliary relays downstream of two undervoltage relays 27 and 27D. This condition would have prohibited protective actions requiring a 1 out of 2 plus 1 out of 2 (1/2 + 1/2) coincidence, such as tripping the normal supply breaker to Bus 14 and stripping 1E loads. The auxiliary relays downstream of undervoltage relays 27B and 27DB would still have functioned as designed, (i.e. the "A" Emergency Diesel Generator would have started on a real undervoltage condition).



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TEXT (If more space is required, use additional NRC Form 308A's) (17)

The exact time of damage occurring to the SSS#1 card for the Bus 14 UVPS cannot be determined. It was noted that after the "A" Emergency Diesel Generator start on June 29th, there was no electrical burnt smell observed by Auxiliary Operators dispatched to the local relay panels. This odor had been characteristic in detecting previous failures of the SSS#1 or SSS#2 card.

As the "A" Emergency Diesel Generator was running and tied into Bus 14 per M-48.14 to satisfy plant Technical Specifications, no immediate operator action was necessary.

On August 5, 1991 at approximately 2013 EDST, the Bus 14 UVPS was returned to service, after repairs and testing were satisfactorily completed.

C. INOPERABLE STRUCTURES, COMPONENTS, OR SYSTEMS THAT CONTRIBUTED TO THE EVENT:

The failed SSS#1 card was the prime contributor to the event.

D. OTHER SYSTEMS OR SECONDARY FUNCTIONS AFFECTED:

None.

E. METHOD OF DISCOVERY:

The event was made apparent during the performance of the preventive maintenance effort on the Bus 14 UVPS.

F. OPERATOR ACTION:

No immediate operator action was necessary, as the "A" Emergency Diesel Generator was running and tied to Bus 14, to satisfy plant Technical Specifications.

G. SAFETY SYSTEM RESPONSES:

None



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 308A's) (17)

III. CAUSE OF EVENT

A. IMMEDIATE CAUSE:

The actuation of auxiliary relays downstream of SSS#1 card on the Bus 14 UVPS was prohibited, due to a component failure on an internal electronic printed circuit card.

B. ROOT CAUSE:

The underlying cause of the internal failure of the system's SSS#1 card was determined to be component degradation due to present circuit design. This design places high wattage resistance in close proximity to transistors on the card, and results in high localized temperatures at the printed circuit card. This high temperature reduces the useful life of electronic components and causes them to fail prematurely.

IV. ANALYSIS OF EVENT

This event is being voluntarily reported using the guidance of NUREG-1022, and Supplement No. 1 to NUREG-1022. This report is intended to alert other utilities which may have similar systems. This event is related to, but does not meet, the reporting requirements of 10CFR50.73, items (a)(2)(v)(D) and (a)(2)(vi). Item (a)(2)(v)(D) requires reporting of "any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident". Item (a)(2)(vi) states that, "Events covered in paragraph (a)(2)(v) of this section may include one or more personnel errors, equipment failures, and/or discovery of design, analysis, fabrication, construction, and/or procedural inadequacies. However, individual component failures need not be reported pursuant to this paragraph if redundant equipment in the same system was operable and available to perform the required safety function."



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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Failure of SSS#1 card on Bus 14 UVPS is an individual component failure which is not reportable because the redundant train of safeguards equipment was fully operable and capable of performing the required safety function.

An assessment was performed considering both the safety consequences and implications of this event with the following results and conclusions:

All potential accident scenarios were evaluated to determine the "worst case" sequence of events and to assess the adequacy of the plant response with the identified card failure present. The "worst case" scenario was identified to be a complete loss of offsite power concurrent with a safety injection (SI). This scenario included a single failure of the "B" Emergency Diesel Generator. The following sequence of events would have occurred:

- "A" Emergency Diesel Generator (D/G) start on Undervoltage of Bus 14
- Bus 14 normal supply breaker "open" from SI and undervoltage of Bus 18.
- Non-1E load shed of Bus 14 from SI signal.
- "A" Emergency D/G supply breaker to Bus 14 would close once the normal supply breaker opened and the diesel was up to proper frequency and voltage.
- The ESF load sequencing timers would be activated but would commence timing at the initiation of the SI signal even though the bus is not energized.

An evaluation was performed to determine if the "A" Emergency Diesel Generator would have been able to accept the Bus 14 "worst case" load. Since the 1E loads would not have stripped on the undervoltage condition and the load sequence timers are activated upon initiation of the SI signal, the worst case block load has been evaluated to be approximately 72% of the diesel generating full load capacity. These loads include (2) Safety Injection Pumps, (2) Containment Recirculation Fans, (1) Containment Spray Pump, (1) Residual Heat Removal Pump and the Motor Control Center loads.



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A computer simulation model was used to determine if the Diesel Generator could accept this worst case block load. The results indicate that the D/G would provide adequate system voltage and frequency and would accept the worst case block load. In addition to these results, a Probability Risk Assessment (PRA) analysis was performed to determine the probability of the "worst case" scenario. The PRA analysis yielded a probability of 1.45E-07/yr. for the above described "worst case" scenario.

Based on the above, it can be concluded that the public's health and safety was assured at all times.

V. CORRECTIVE ACTION

A. ACTION TAKEN TO RETURN AFFECTED SYSTEMS TO PRE-EVENT NORMAL STATUS:

- o The Bus 14 SSS#1 was replaced with a qualified spare.
- o Although the required end-to-end testing of the UVPS is performed annually (utilizing RSSP-2.2), the scope of Periodic Test Procedure, PT-9.1 (Undervoltage Protection 480 Volt Safeguards Busses) was enhanced to include end-to-end testing of the UVPS, to prove complete circuit integrity. PT-9.1 is performed monthly on each safeguards bus, and the enhanced PT-9.1 was successfully performed on Bus 14.
- o Complete end-to-end testing per PT-9.1 was also completed on all safeguards 480 volt buses 16, 17, and 18, and all UVPS circuits were found intact.



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TEXT (If more space is required, use additional NRC Form 305A's) (17)

B. ACTION TAKEN OR PLANNED TO PREVENT RECURRENCE:

- o Extensive indepth training had recently been conducted for maintenance and test personnel on the Ginna UVPS. This training contributed greatly to the root cause determination and corrective actions required for the failures.
- o As an interim corrective action, the eight SSS#1 and SSS#2 cards for Buses 14, 16, 17, and 18 will be changed out periodically with qualified spares. This change out is complete for Safeguards Buses 14 and 16, and Safeguards Buses 17 and 18 will be done as soon as qualified replacement cards become available.
- o End-to-end testing per PT-9.1 will continue to be performed on a monthly basis. Based on the long term corrective actions taken, the frequency at which end-to-end testing is performed may be adjusted accordingly.
- o Three other Ginna systems designed by ABB Electro-Mechanics, Inc. were identified. These systems were investigated, and it was determined that similar failures, that could affect the performance of plant systems, will not occur with these three systems.
- o Long term corrective action will be to have Engineering evaluate the design of the UVPS, and make recommendations for improvement to prevent recurrence of the problems experienced.



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

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TEXT (If more space is required, use additional NRC Form 305A's) (17)

VI. ADDITIONAL INFORMATION

A. FAILED COMPONENTS:

The failed solid state switch printed circuit boards were supplied by ABB Electro-Mechanics, Inc. part number 33013-898 and 33013-899, assembly numbers 03021-287 and 03021-288.

B. PREVIOUS LERs ON SIMILAR EVENTS:

A similar LER event historical search was conducted with the following results: LER 88-008 (Safeguards Bus Undervoltage Relay Actuation Due To A Failed Solid State Switch Caused Automatic Start Of "B" Emergency Diesel Generator) was a similar event. The root cause of LER 88-008 was determined to be a random failure of an electronic component and no corrective action was deemed necessary to prevent recurrence. LER 90-015 (Safeguards Bus Undervoltage Relay Actuation Due To A Failed Solid State Switch Causes An Automatic Start Of The "A" Emergency Diesel Generator) was a similar event. The root cause of LER 90-015 was determined to be a failure of an electronic component. Corrective action taken was to perform thermography on the failed solid state switch printed circuit board and then provide the results of this thermography to Electro-Mechanics, the system designer, for review. Based on the review of the thermography results by Rochester Gas and Electric Corporation and ABB Electro-Mechanics, Inc. the need for establishing a program for replacement of existing solid state switch printed circuit boards was evaluated. LER 91-007 (Safeguards Buses Undervoltage Relay Actuations Due To Failed Solid State Switches Causes Automatic Starts Of The "B" Emergency Diesel Generator) was also a similar event. The corrective action for LER 90-015 led to the root cause determination and corrective action for LER 91-007.

C. SPECIAL COMMENTS:

None.



11-1-11